LDC

#12

Attorney Docket No. ATI-204

UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner: G. Arthur — Art Unit: 3661

Re: Application of: David S. Breed et al.

Serial No.: 09/853,118

Filed: May 10, 2001

For: SYSTEM FOR DETERMINING THE OCCUPANCY STATE OF A SEAT IN A VEHICLE AND CONTROLLING A COMPONENT BASED THEREON

LETTER TO DRAFTSPERSON

Assistant Commissioner for Patents
Washington, D.C. 20231

May 15, 2002

Dear Sir:

Submitted herewith are formal drawings of FIGS. 1-40.

FOR THE APPLICANTS
Respectfully submitted,

Brian Roffe
Reg. No. 35,336

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Fax: (516) 295-0318

I hereby certify that this correspondence and/or fee is being deposited with the United States Postal Service as first class mail in an envelope addressed to the "Assistant Commissioner for Patents, Washington, D.C. 20231" on May 15, 2002.

Brian Roffe, Esq.

04.02

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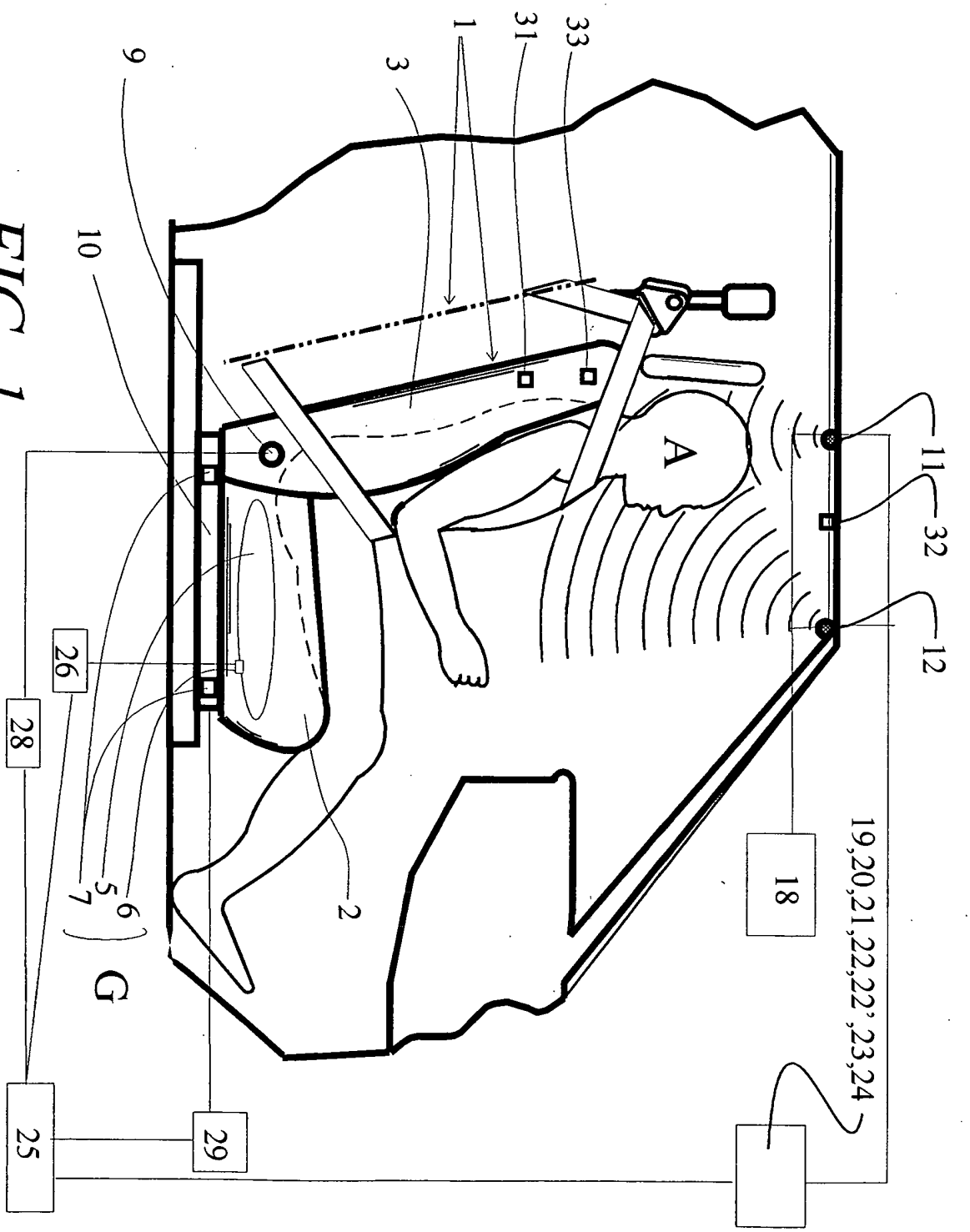

FIG. 1

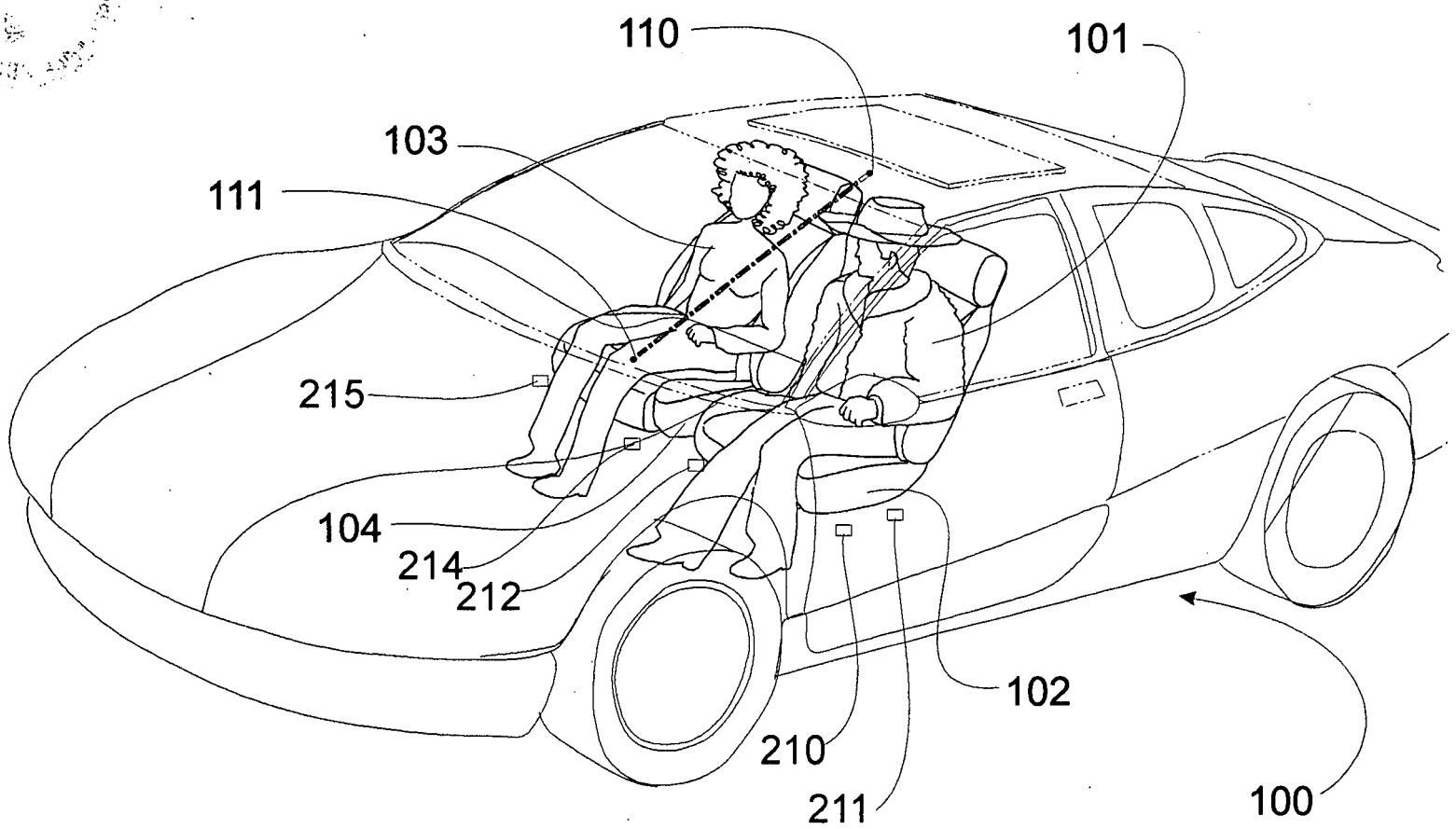

FIG. 2

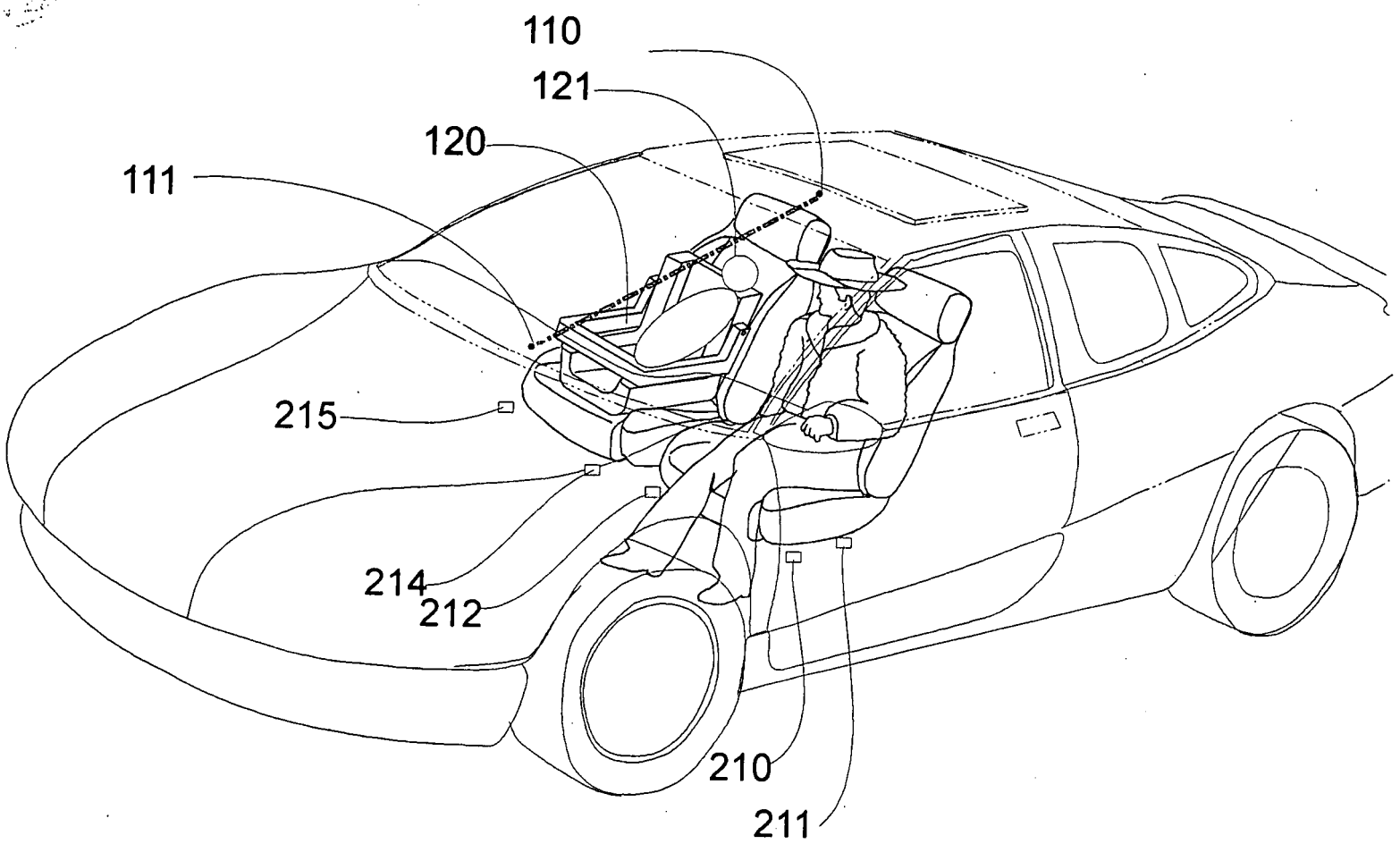

FIG. 3

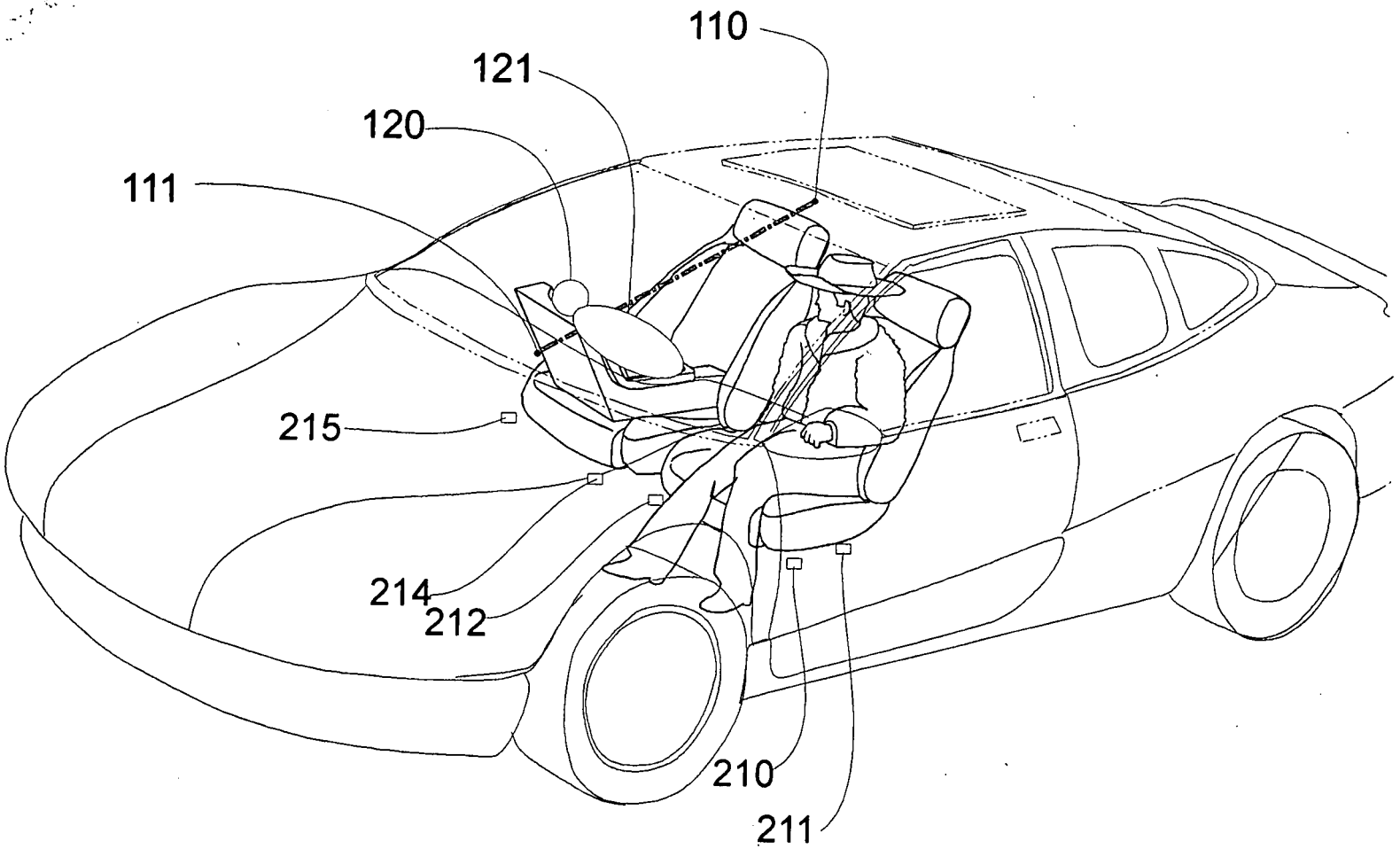

FIG. 4

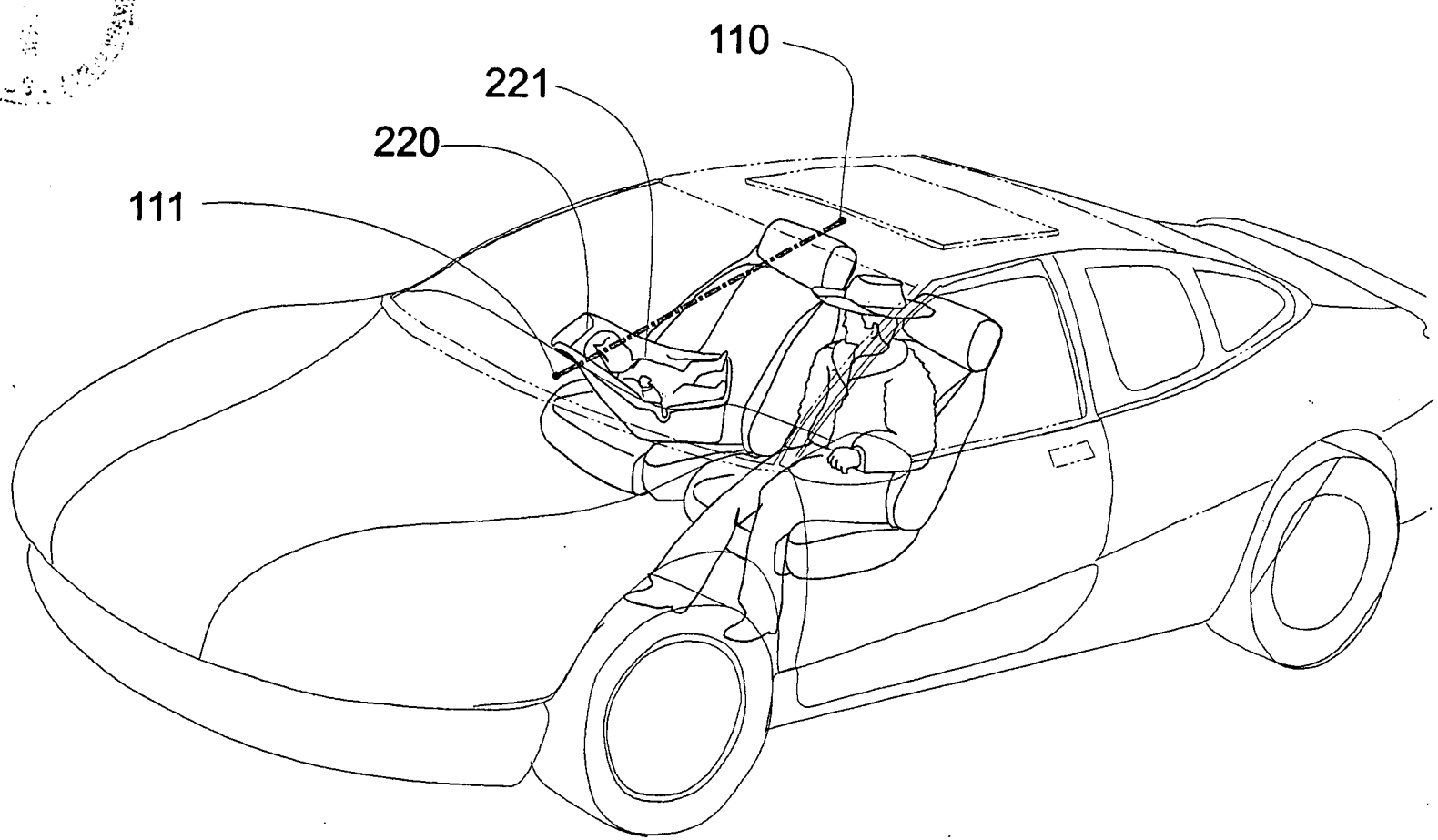

FIG. 5

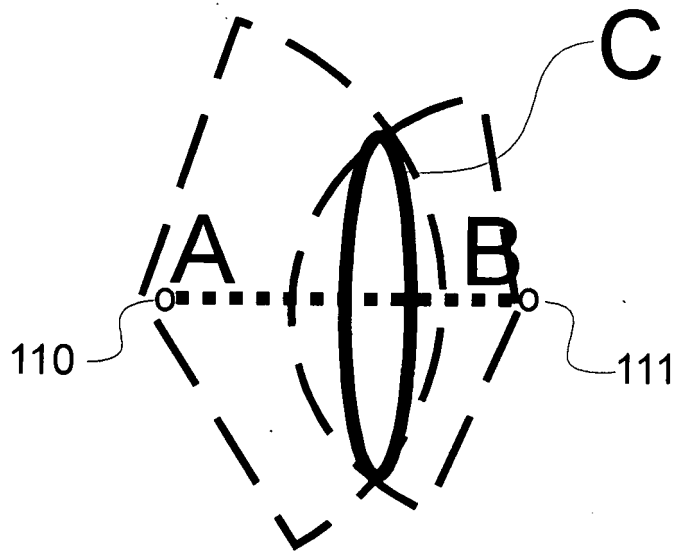

FIG. 6

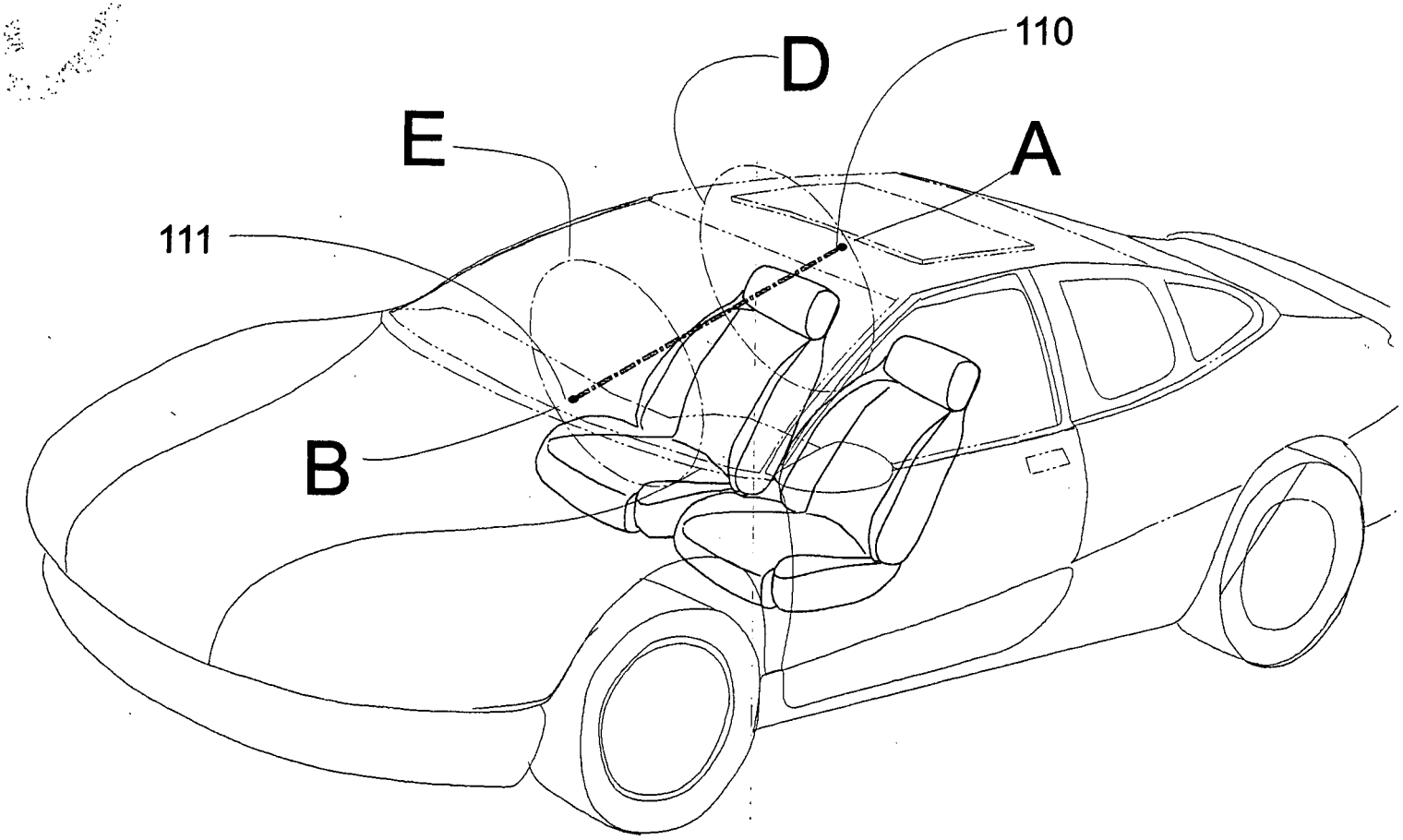

FIG. 7

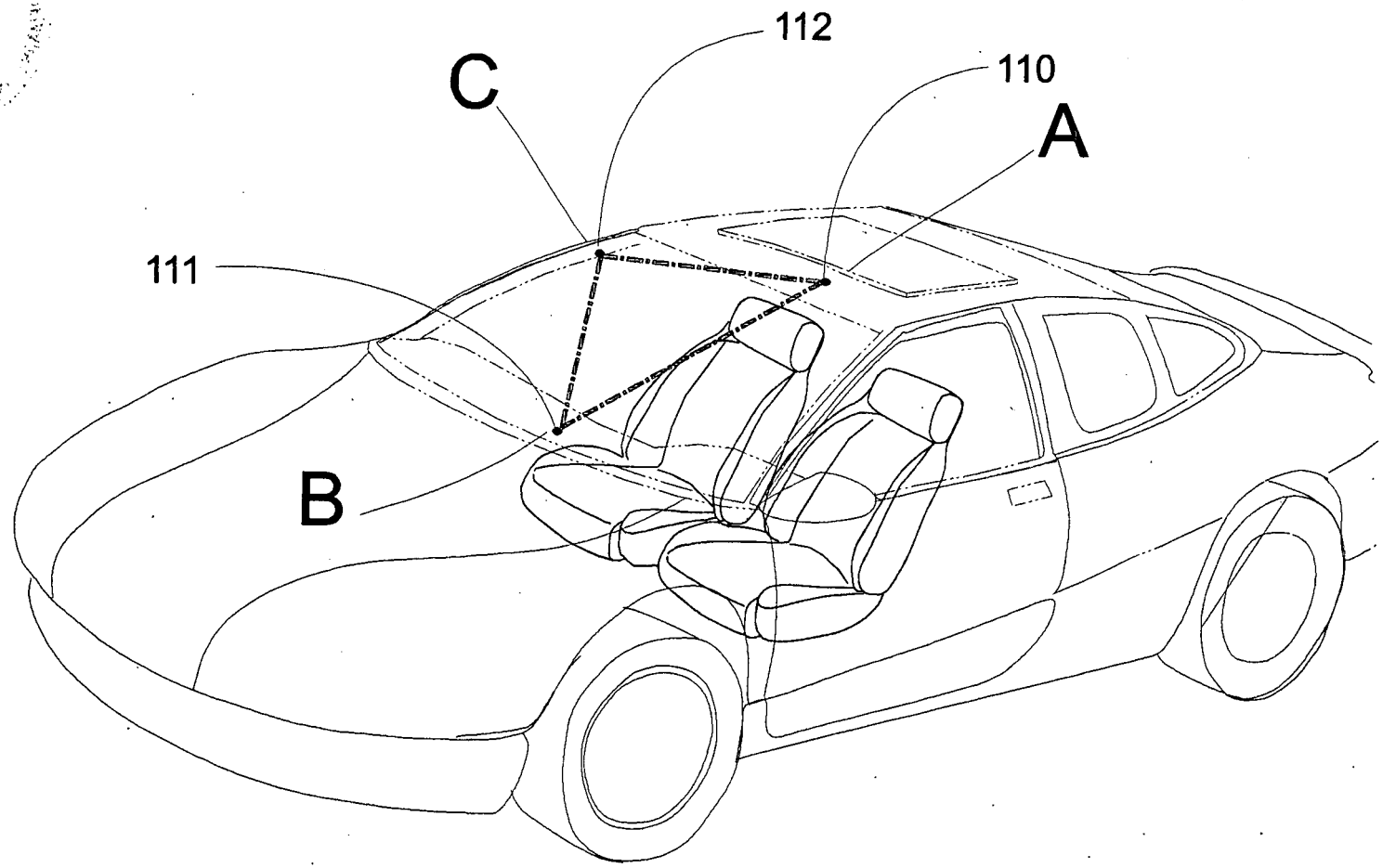

FIG. 8

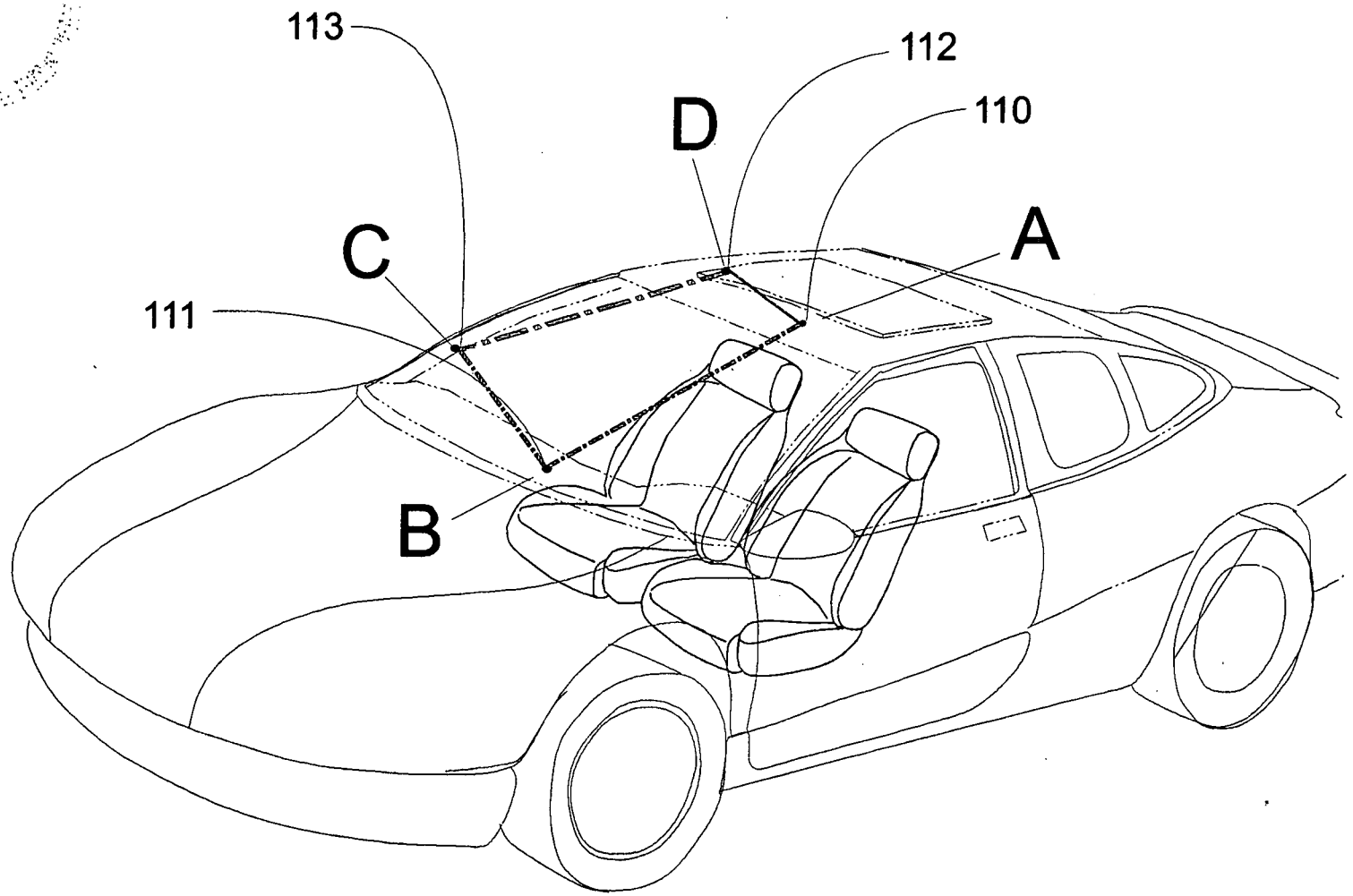

FIG. 9

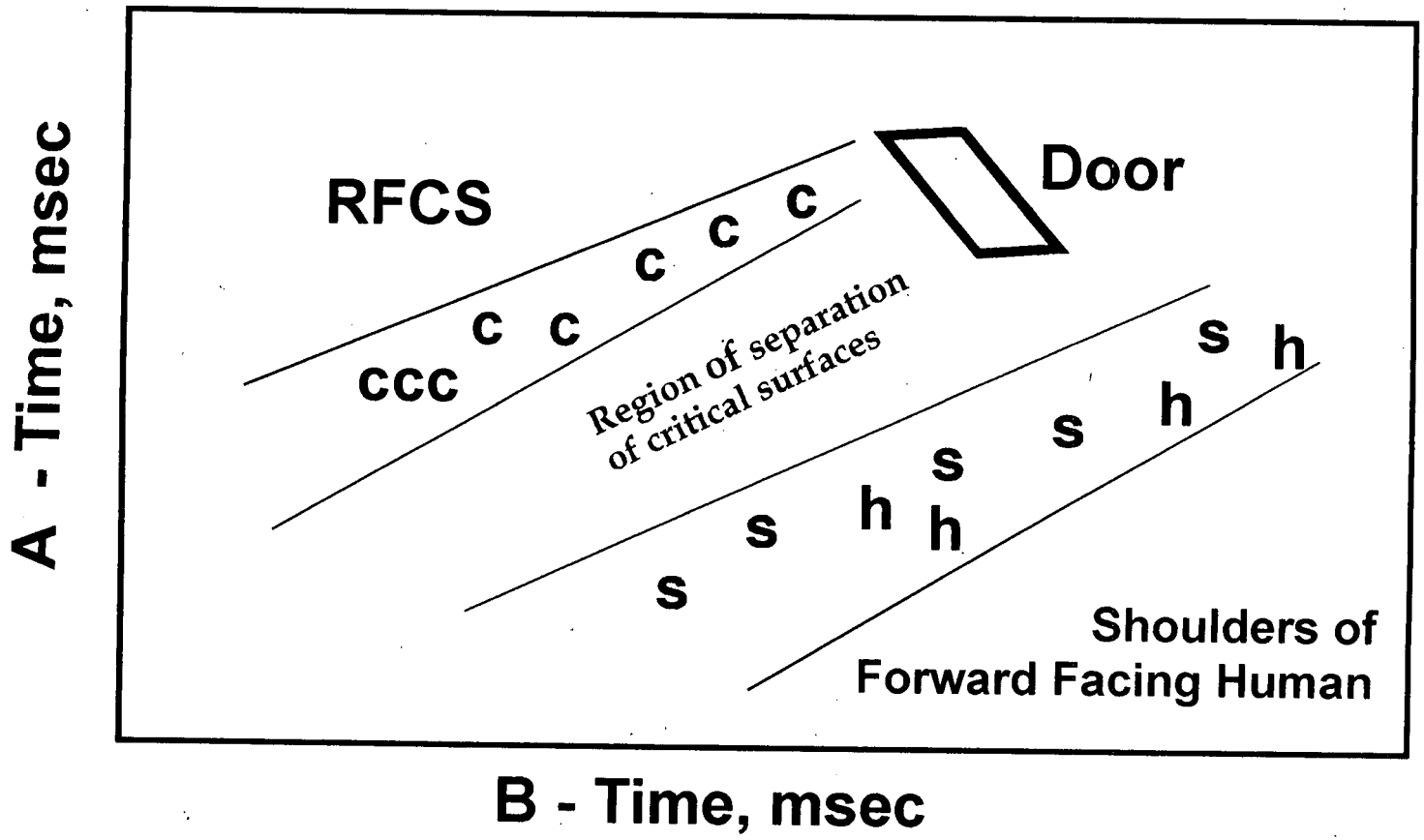
A - Time, msec
RFCS
Door
c c c c c c
ccc
Region of separation
of critical surfaces
s h
s h s
s h h
s
Shoulders of
Forward Facing Human
B - Time, msec

FIG. 10

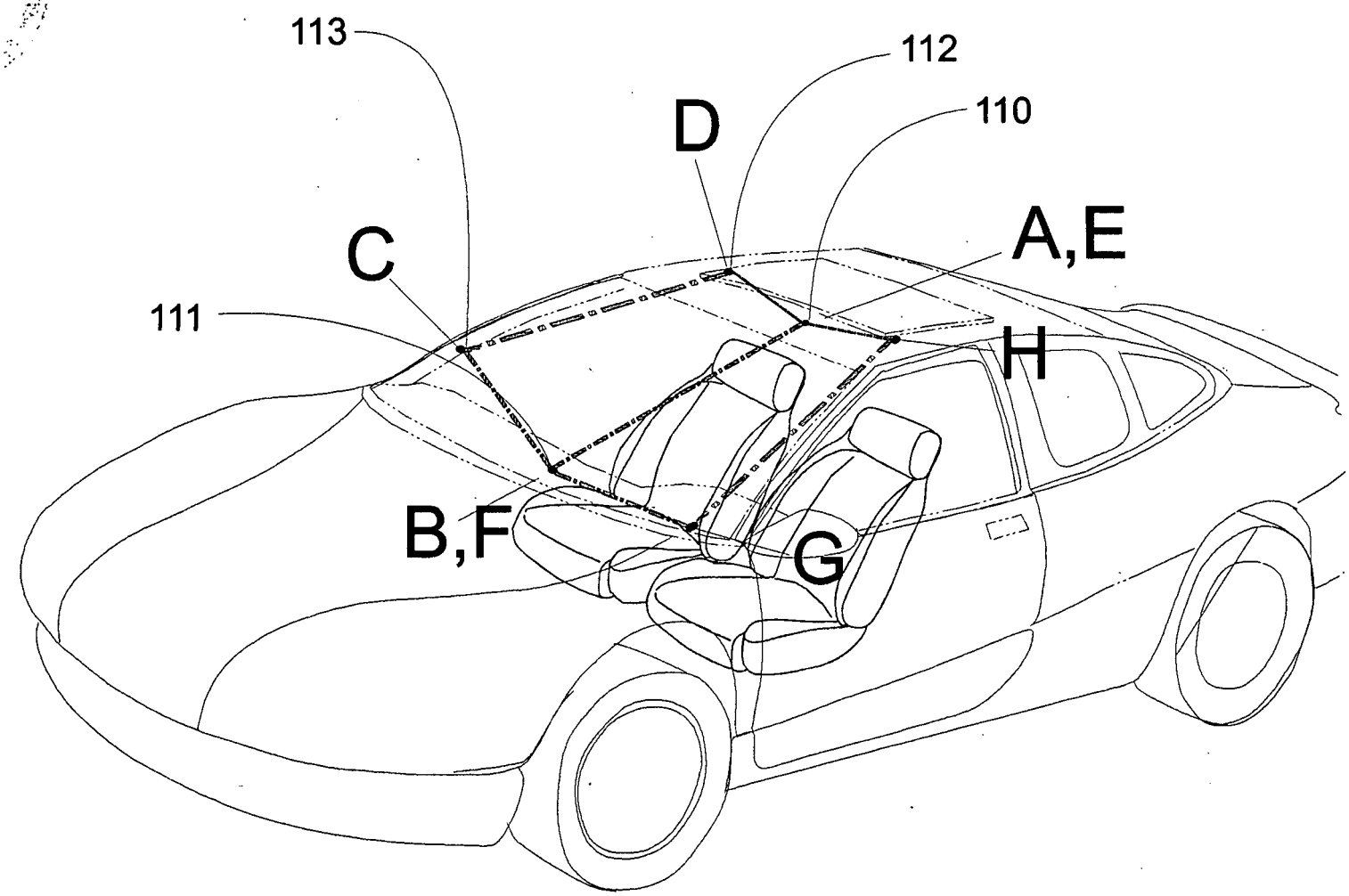

FIG. 11

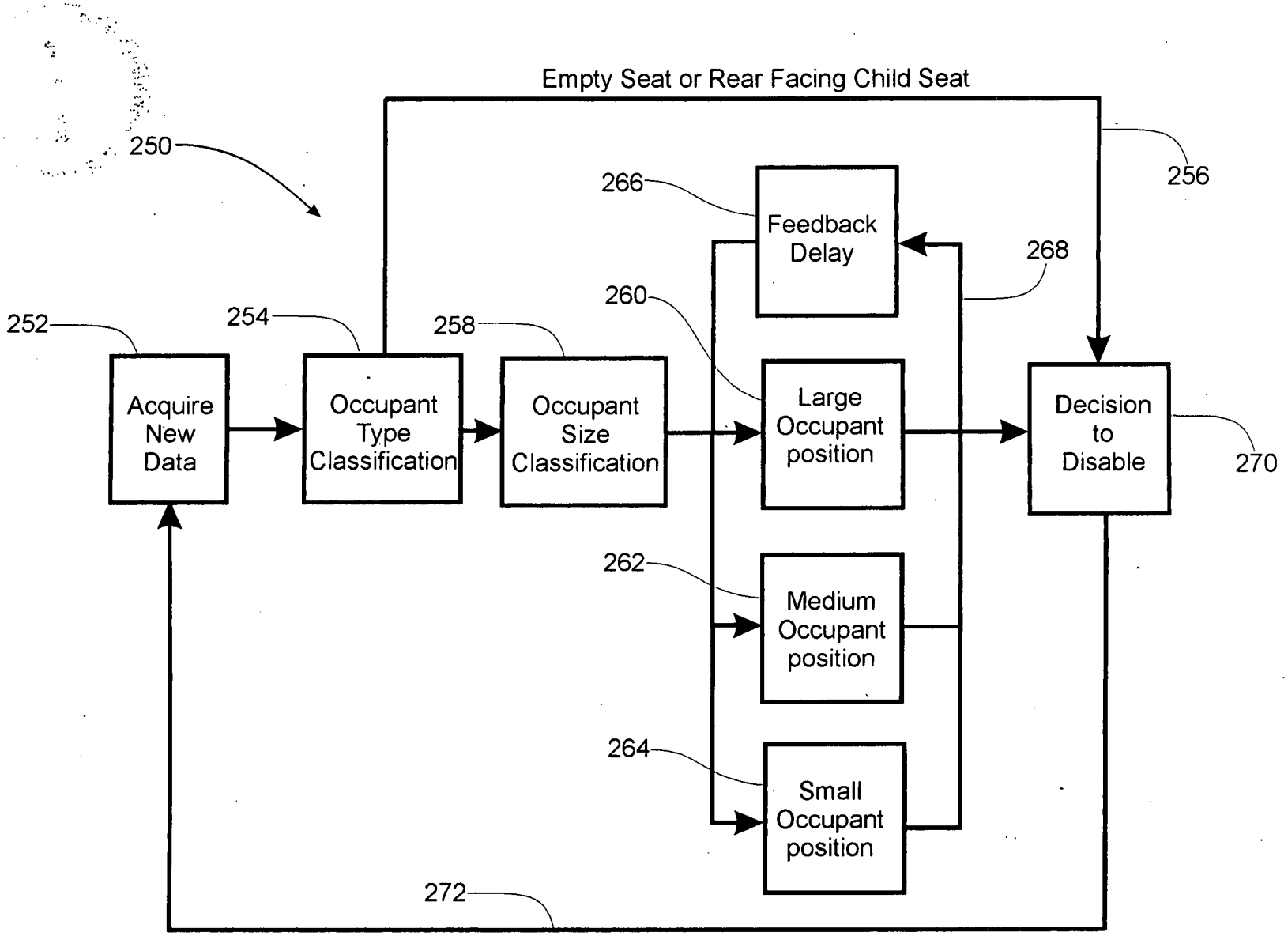
Empty Seat or Rear Facing Child Seat
250
256
266
Feedback Delay
268
260
252
254
258
Acquire New Data
Occupant Type Classification
Occupant Size Classification
Large Occupant position
Decision to Disable
270
262
Medium Occupant position
264
Small Occupant position
272

FIG. 12

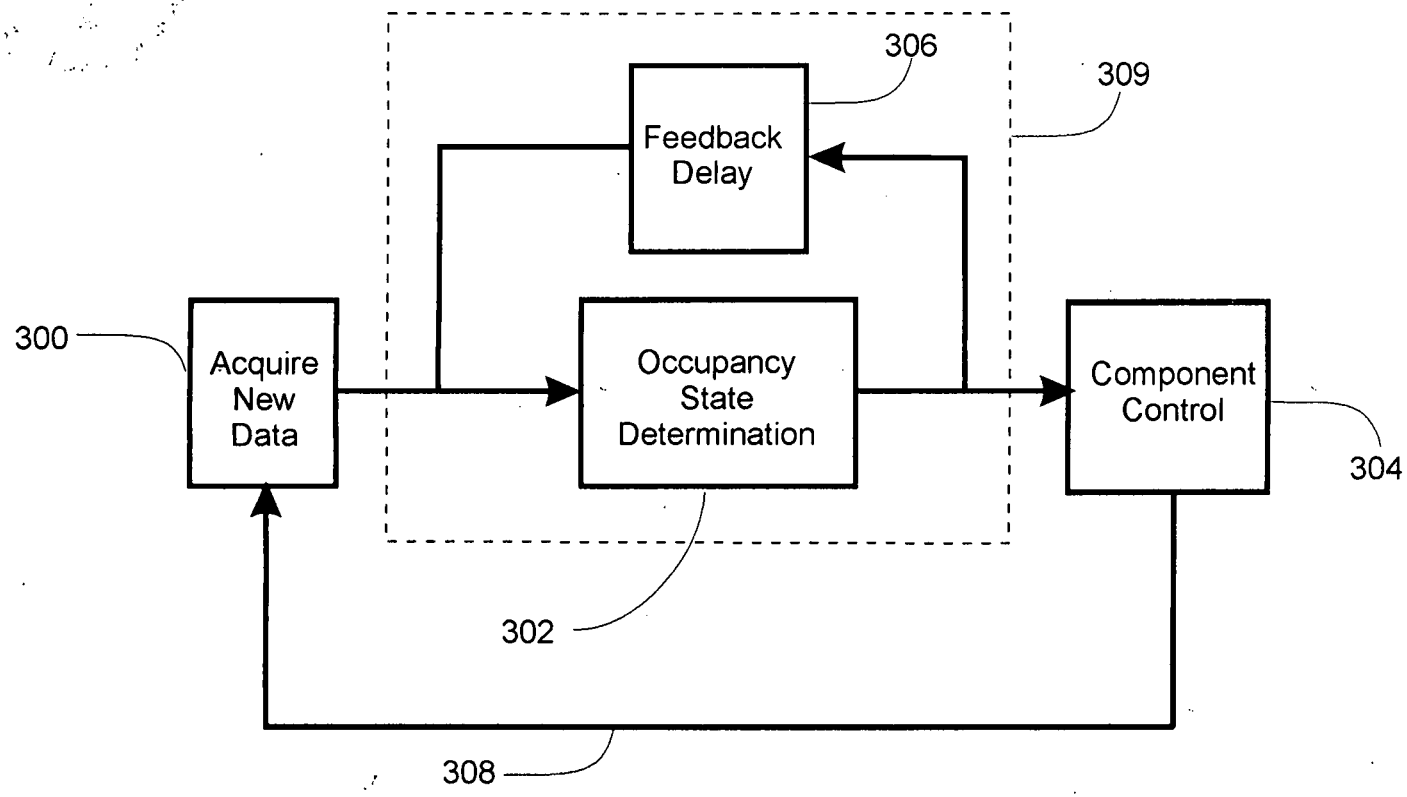
306
309
Feedback Delay
300
Acquire New Data
Occupancy State Determination
Component Control
304
302
308

FIG. 13

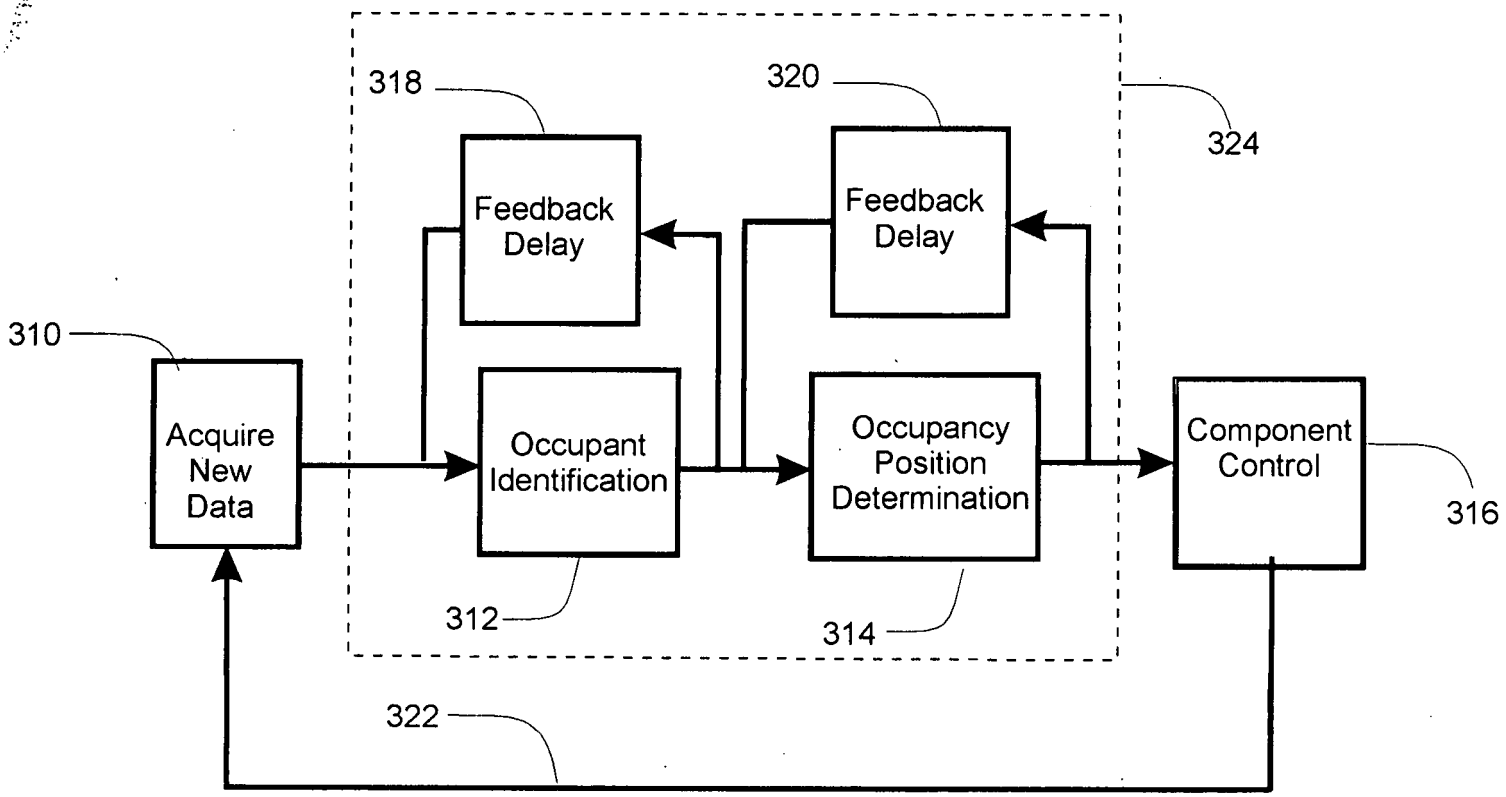
318
320
324
Feedback Delay
Feedback Delay
310
Acquire New Data
Occupant Identification
Occupancy Position Determination
Component Control
316
312
314
322

FIG. 14

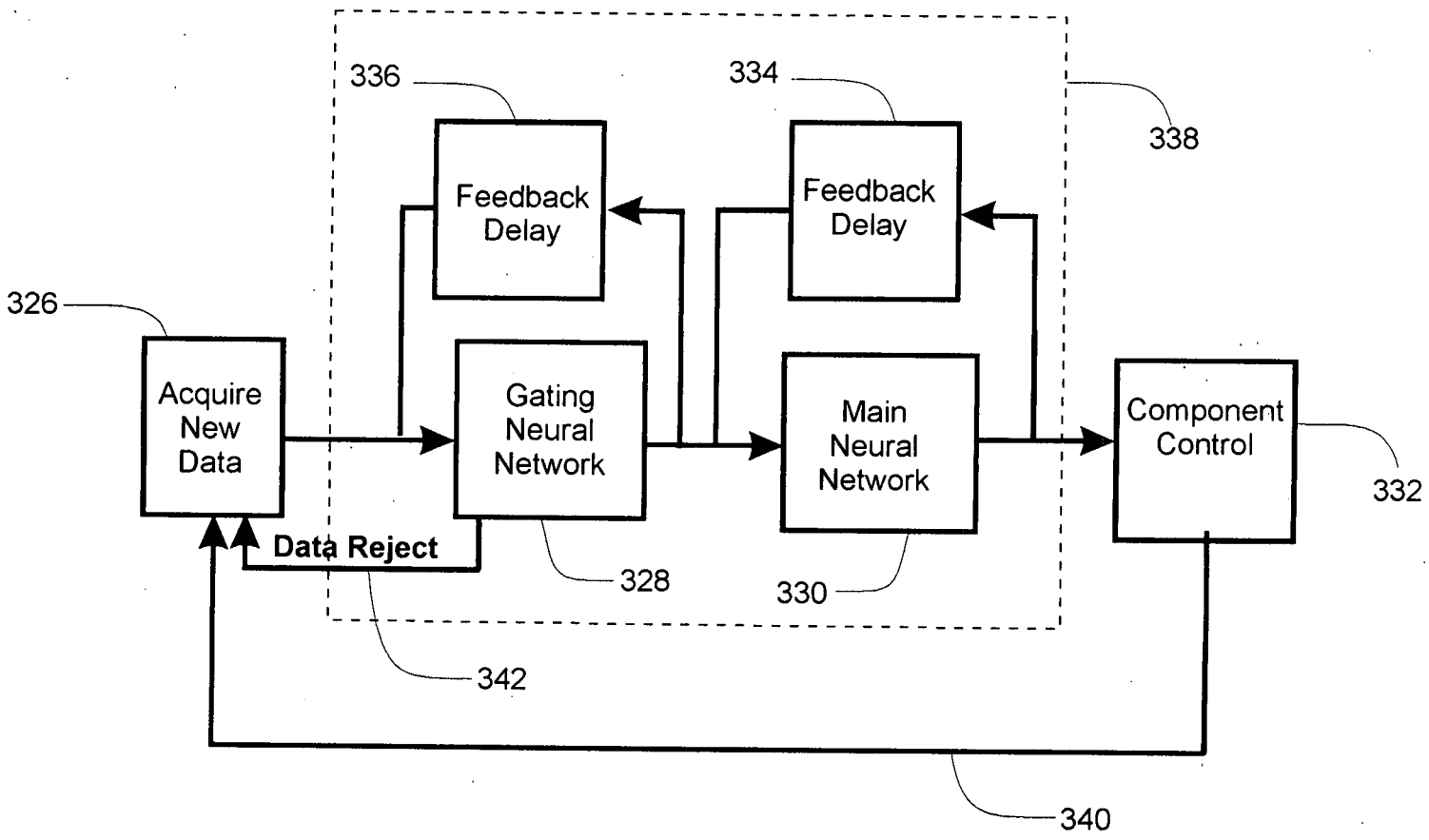
336
334
338
Feedback Delay
Feedback Delay
326
Acquire New Data
Gating Neural Network
Main Neural Network
Component Control
332
Data Reject
328
330
342
340

FIG. 15

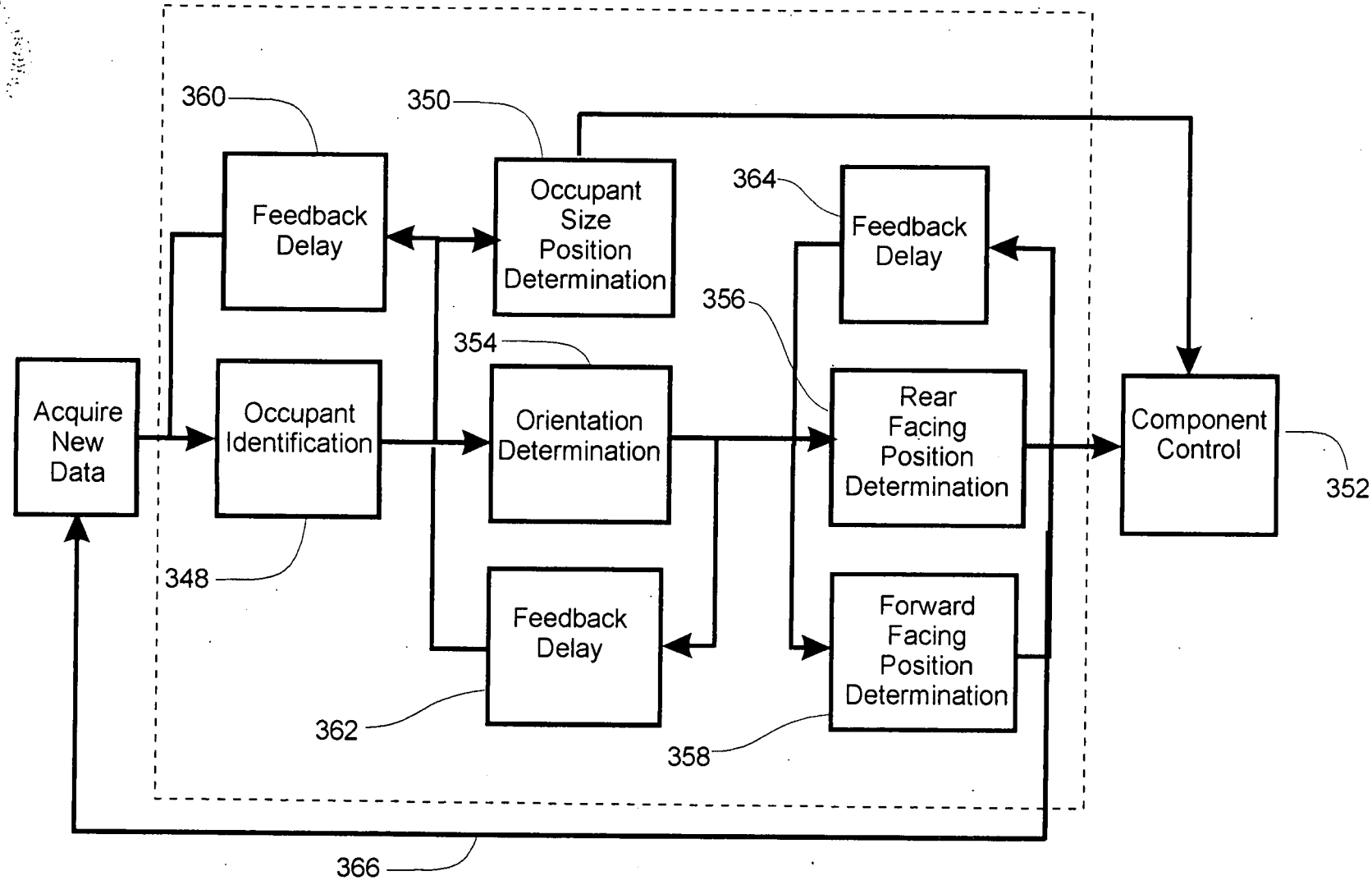
360
350
Feedback Delay
Occupant Size Position Determination
364
Feedback Delay
356
354
Acquire New Data
Occupant Identification
Orientation Determination
Rear Facing Position Determination
Component Control
352
348
Feedback Delay
Forward Facing Position Determination
362
358
366

FIG. 16

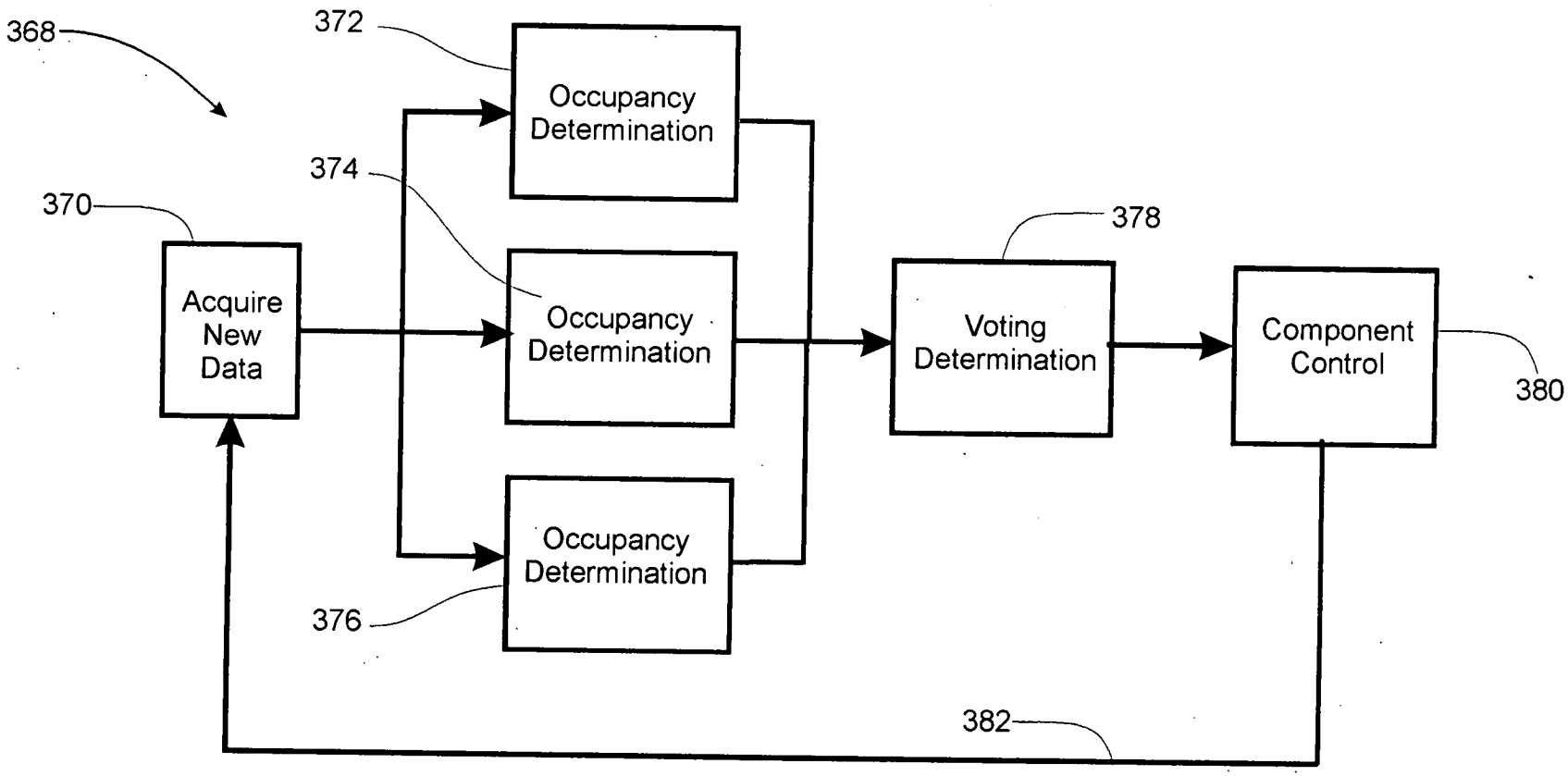
368
372
Occupancy Determination
374
370
Acquire New Data
Occupancy Determination
378
Voting Determination
Component Control
380
Occupancy Determination
376
382

FIG. 17

Subject Classification

Class	Instances	Weight Category	State
ES	Empty Seat	<10 lb	Empty
FFA	Normally Seated Adult	> 05 lb	Enable
FFC	Normally Seated Child	<10,105> lb	Enable
FFC	Normally Positioned Forward Facing Child Seat	<10,45> lb	Enable
OOP	Out-of-position Adult	>105 lb	Disable
OOP	Out-of-position Child	<105 lb	Disable
OOP	Out-of-position Forward Facing Child Seat	<10,45> lb	Disable
RFS	Rearward Facing Child Seat	<10,45> lb	Disable
RFS	Rearward Facing Infant Seat	<10,45> lb	Disable

FIG. 18

Categorization of Human Subjects

	Weight Range kg (lb)		Height Range m (in	
Child		<0.95,1 .1 5> (<3'1",3'9">)	<1.10,1.30> (<3'7",4'3">)	<1.25,1.45> (<4'1",4'9">)
	<11,25>(<24,55>)	C11	C12	C13
	<22,36> (<48,79>)	C21	C22	C23
	<33,47> (<73,103>)	C31	C32	C33
Adult		<1 .45, 1 .65> (<49,555')	<1 .60,1 .80> (<53,51 1 '5')	<1 .75, 1 .95> (<59,655')
	<45,70>('<99,154>)	A11	A12	A13
	<65,90> (<143,198>)	A21	A22	A23
	<85,110>(<187,242>)	A31	A32	A33

All Human Subjects are to wear light clothes (typically slacks and T-shirt) on entry.
Other types of clothing to be provided by ATI

Child Surrogates

Doll		Baby=0.50m (approx. 20")	Infant=0.75m (approx. 30")	Child=1.20m (approx. 48")

FIG. 19

Rearward Facing Infant Seats

Designation	Child Seat	Attributes
Training	Arriva	base, hood
Independent	Assura565	hood
Training	Baby-Safe	-
Training	Century 590	base, hood
Training	Evenflo Discovery	base, Tbar
Training	Evenflo Joyride (new)	hood
Independent	Evenflo Joyride (old)	-
Training	GerryGuard	base
Validation	Kolcraft Travelabout	base, Tbar
Training	Rock-n-Ride	-
Training	TLC	-

FIG. 20

Rearward Facing Child Seat

Designation	Child Seat	Attributes
Training	Centuryl000	-
Validation	Century 2000 STE	-
Training	CenturyOvation	-
Training	Century Smartmove 5T	table
Training	Champion	table
Training	Fisher Price Child Seat	table
Training	Touriva	-
Training	Ultara	table
Training	Vario Exclusive	table

FIG. 21

Forward Facing Child and Booster Seats

Designation	Child Seat	Attributes
Training	Centuryl000	-
Validation	Century 2000 STE	-
Training	CenturyOvation	-
Validation	Century Smartmove 5T	table
Training	Champion	table
Validation	Fisher Price Booster	-
Training	Fisher Price Child Seat	table
Training	Gerry Booster	table
Training	Touriva	-
Training	Ultara	table
Training	Vario Exclusiv	table

FIG. 22

Vehicle Configuration Series

Config	Visor										Convertible Top									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
A	U	D	U	D	S	U	D	U	D	S	U	U	U	U	U	D	D	D	D	D
B	D	U	D	U	S	D	U	D	U	S	D	D	D	D	D	U	U	U	U	U
C	U	D	S	U	D	U	D	S	U	D	D	D	D	D	D	U	U	U	U	U
D	D	U	S	D	U	D	U	S	D	U	U	U	U	U	U	D	D	D	D	D
E	D	U	D	S	D	U	D	S	U	D	U	U	U	U	U	D	D	D	D	D
F	U	D	U	S	D	U	D	S	U	D	D	D	D	D	D	U	U	U	U	U
G	U	S	D	U	D	U	D	U	S	D	D	D	D	D	D	U	U	U	U	U
H	D	S	U	D	U	D	U	D	S	U	U	U	U	U	U	D	D	D	D	D

FIG. 23B

Sequence for Child Seat Training Data Collection:

Start object in center of the seat. Trainer has both hands on the steering wheel;
With a smooth motion, push the object fully outboard, then pull it fully inboard, then push it to center position, then put hands back on the steering wheel;
With a smooth motion, rotate the object 45 degrees outboard, the rotate 45 degrees inboard, then rotate back to center, then put hands back on the steering wheel;

Sequence for Out-of-Position Forward Facing Child Seat Training Data Collection

Start with object in the center line, leaning onto the Instrument Panel;
With a smooth motion, push the object fully outboard, then pull it fully inboard, then push it to the center;
Repeat this sequence with a 1 50 mm (6") gap between the object and the Instrument Panel; Apply small (+/- 10°) rotations.
Repeat this sequence with a 300 mm (12") gap between the object and the Instrument Panel; Apply small (+/- 10°) rotations.

FIG. 23C

Sequence for Human Subject Training Data Collection:

Lean forward and outboard such that head and/or shoulders touch the Fire line;
Gently traverse inboard while carefully following the Fire line until the center of the vehicle is reached;
Lean halfway back towards the seatback and traverse outboard up against the side window. Rotate torso while doing so;
Lean back into the seat and traverse inboard towards the center. Rotate torso while doing so;
Sit back in the seat; "operate" radio controls, glove box, window, or seat controls; assume a brace posture;
Do *not* cross the Fire line with head and/or shoulders at any time.

Sequence for Out-of-Position Human Subject Training Data Collection:

Lean forward and outboard such that head and/or shoulders touch the Instrument Panel;
Gently traverse inboard towards the center console;
Move back 150 mm (6") and gently traverse back to the most outboard position;
Move back 300 mm (12") and gently traverse back to the center console;
"Operate" radio controls and glovebox while head and/or shoulders remain in front of the Fire line.

FIG. 23D

Network Training Set Collection Matrix (Vehicle E)
Rev 1.1

#	Class	Subject/Object	Attributes	Actions	Config.	Belt	Conditions
1	ES	None	None	Motions of track and recline	(A)	N.A.	Ambient
2	FFA	A22	Medium Clothes, Magazine	Motions in safe seating area	B	Yes	Ambient
3	OOP	A22	Medium Clothes	Motions in NFZ	C	No	Ambient
4	FFC	Century 1000	Infant Doll	Motions in safe seating area	D	No	Ambient
5	RFS	Century 1000	Baby Doll	Motions in entire seating area	E	No	Ambient
6	ES	None	Beaded Cover	Motions of track and recline	(F)	N.A.	Ambient
7	FFA	A11	Medium Clothes	Motions in safe seating area	G	Yes	Ambient
8	OOP	Touriva	Infant Doll, Blanket	Motions in NFZ	H	No	Ambient
9	FFC	Touriva	Infant Doll, Blanket	Motions in safe seating area	A	No	Ambient
10	RFS	Century 590	Baby Doll, Hood	Motions in entire seating area	B	No	Ambient
11	ES	None	Fabric Cover	Motions of track and recline	(C)	N.A.	Ambient
12	FFA	A33	Medium Clothes, Newspaper	Motions in safe seating area	D	No	Ambient
13	OOP	A33	Medium Clothes	Motions in NFZ	E	Yes	Ambient
14	FFC	C22	Medium Clothes	Motions in safe seating area	F	No	Ambient
15	RFS	Touriva	Baby Doll, Blanket	Motions in entire seating area	G	No	Ambient
16	ES	None	Blanket	Motions of track and recline	(H)	N.A.	Ambient
17	FFA	A21	Heavy Clothes	Motions in safe seating area	A	No	Ambient
18	OOP	C11	Heavy Clothes	Motions in NFZ (standing)	B	No	Ambient
19	FFC	C11	Heavy Clothes	Motions in safe seating area	C	No	Ambient

FIG. 24A

20	RFS	TLC	Baby Doll	Motions in entire seating area	D	No	Ambient
21	ES	None	None	Motions of track and recline	(E)	N.A.	Solar Heat
22	FFA	A12	Light Clothes, Magazine	Motions in safe seating area	F	Yes	Solar Heat
23	OOP	A12	Light Clothes	Motions in NFZ	G	No	Solar Heat
24	FFC	Champion	Infant Doll	Motions in safe seating area	H	No	Solar Heat
25	RFS	Champion	Baby Doll	Motions in entire seating area	A	No	Solar Heat
26	ES	None	Beaded Cover	Motions of track and recline	(B)	N.A.	Solar Heat
27	FFA	A23	Light Clothes	Motions in safe seating area	C	Yes	Solar Heat
28	OOP	Vario Exclusive	Child Doll	Motions in NFZ	D	No	Solar Heat
29	FFC	Vario Exclusive	Child Doll, Blanket	Motions in safe seating area	E	No	Solar Heat
30	RFS	Joyride (new)	Baby Doll	Motions in entire seating area	F	No	Solar Heat
31	ES	None	Fabric Cover	Motions of track and recline	(G)	N.A.	Solar Heat
32	FFA	A32	Light Clothes, Newspaper	Motions in safe seating area	H	No	Solar Heat
33	OOP	A32	Light Clothes	Motions in NFZ	A	Yes	Solar Heat
34	FFC	C33	Light Clothes	Motions in safe seating area	B	No	Solar Heat
35	RFS	Ultara	Baby Doll, Blanket	Motions in entire seating area	C	No	Solar Heat
36	ES	None	Blanket	Motions of track and recline	(D)	N.A.	Solar Heat
37	FFA	A22	Medium Clothes	Motions in safe seating area	E	No	Solar Heat
38	OOP	C21	Medium Clothes	Motions in NFZ	F	No	Solar Heat
39	FFC	C21	Medium Clothes	Motions in safe seating area	G	No	Solar Heat
40	RFS	Arriva	Baby Doll, Hood	Motions in entire seating area	H	No	Solar Heat
41	ES	None	Handbag	Motions of track and recline	(H)	N.A.	Ambient
42	FFA	A11	Heavy Clothes, Magazine	Motions in safe seating area	G	Yes	Ambient

FIG. 24B

43	OOP	A11	Heavy Clothes	Motions in NFZ	F	No	Ambient
44	FFC	Gerry Booster	Infant Doll	Motions in safe seating area	E	No	Ambient
45	RFS	Fisher Price CS	Baby Doll	Motions in entire seating area	D	No	Ambient
46	ES	None	Beaded Cover, Handbag	Motions of track and recline	(C)	N.A.	Ambient
47	FFA	A33	Heavy Clothes	Motions in safe seating area	B	Yes	Ambient
48	OOP	Ultara	Inflant Doll, Blanket	Motions in NFZ	A	No	Ambient
49	FFC	Ultara	Inflant Doll, Blanket	Motions in safe seating area	H	No	Ambient
50	RFS	Baby Safe	Baby Doll, Handle up	Motions in entire seating area	G	No	Ambient
51	ES	None	Fabric Cover, Handbag	Motions of track and recline	(F)	N.A.	Ambient
52	FFA	A21	Heavy Clothes, Newspaper	Motions in safe seating area	E	No	Ambient
53	OOP	A21	Heavy Clothes	Motions in NFZ	D	Yes	Ambient
54	FFC	C12	Heavy Clothes	Motions in safe seating area	C	No	Ambient
55	RFS	Vario Exclusive	Baby Doll, Blanket	Motions in entire seating area	B	No	Ambient
56	ES	None	Blanket, Handbag	Motions of track and recline	(A)	N.A.	Ambient
57	FFA	A12	Rain Clothes	Motions in safe seating area	H	No	Ambient
58	OOP	C23	Rain Clothes	Motions in NFZ	G	No	Ambient
59	FFC	C23	Rain Clothes	Motions in safe seating area	F	No	Ambient
60	RFS	Rock'n'Ride	Baby Doll	Motions in entire seating area	E	No	Ambient
61	ES	None	None	Motions of track and recline	(D)	N.A.	Air Conditioner
62	FFA	A23	Light Clothes, Magazine	Motions in safe seating area	C	Yes	Air Conditioner

FIG. 24C

63	OOP	A23	Light Clothes	Motions in NFZ	B	No	Air Conditioner
64	FFC	Century Ovation	Inflant Doll	Motions in safe seating area	A	No	Air Conditioner
65	RFS	Century Ovation	Baby Doll	Motions in entire seating area	H	No	Air Conditioner
66	ES	None	Beaded Cover	Motions of track and recline	(G)	N.A.	Air Conditioner
67	FFA	A32	Light Clothes	Motions in safe seating area	F	Yes	Air Conditioner
68	OOP	Fisher Price CS	Child Doll	Motions in NFZ	E	No	Air Conditioner
69	FFC	Fisher Price CS	Child Doll, Blanket	Motions in safe seating area	D	No	Air Conditioner
70	RFS	Gerry Guard	Baby Doll	Motions in entire seating area	C	No	Air Conditioner
71	ES	None	Fabric Cover	Motions of track and recline	(B)	N.A.	Air Conditioner
72	FFA	A22	Light Clothes, Newspaper	Motions in safe seating area	A	No	Air Conditioner
73	OOP	A22	Light Clothes	Motions in NFZ	H	Yes	Air Conditioner
74	FFC	C32	Light Clothes	Motions in safe seating area	G	No	Air Conditioner
75	RFS	Smartmove 5T	Baby Doll, Blanket	Motions in entire seating area	F	No	Air Conditioner
76	ES	None	Blanket	Motions of track and recline	(E)	N.A.	Air Conditioner
77	FFA	A11	Medium Clothes	Motions in safe seating area	D	No	Air Conditioner
78	OOP	C22	Medium Clothes	Motions in NFZ	C	No	Air Conditioner
79	FFC	C22	Medium Clothes	Motions in safe seating area	B	No	Air Conditioner
80	RFS	Discovery	Baby Doll, Handle up	Motions in entire seating area	A	No	Air Conditioner
81	ES	None	Pizza Box	Motions of track and recline	(B)	N.A.	Ambient
82	FFA	A33	Rain Clothes, Magazine	Motions in safe seating area	A	Yes	Ambient
83	OOP	A33	Rain Clothes	Motions in NFZ	D	Yes	Ambient
84	FFC	Champion	Infant Doll	Motions in safe seating area	C	No	Ambient

FIG. 24D

85	RFS	Champion	Baby Doll	Motions in entire seating area	F	No	Ambient
86	ES	None	Beaded Cover, Pizza Box	Motions of track and recline	(E)	N.A.	Ambient
87	FFA	A21	Rain Clothes	Motions in safe seating area	H	Yes	Ambient
88	OOP	Vario Exclusive	Child Doll, Blanket	Motions in NFZ	G	No	Ambient
89	FFC	Vario Exclusive	Child Doll, Blanket	Motions in safe seating area	B	No	Ambient
90	RFS	Joyride (new)	Baby Doll, Hood	Motions in entire seating area	A	No	Ambient
91	ES	None	Fabric Cover, Pizza Box	Motions of track and recline	(D)	N.A.	Ambient
92	FFA	A12	Rain Clothes, Newspaper	Motions in safe seating area	C	No	Ambient
93	OOP	A12	Rain Clothes	Motions in NFZ	F	No	Ambient
94	FFC	C23	Rain Clothes	Motions in safe seating area	E	No	Ambient
95	RFS	Ultara	Baby Doll, Blanket	Motions in entire seating area	H	No	Ambient
96	ES	None	Blanket, Pizza Box	Motions of track and recline	(G)	N.A.	Ambient
97	FFA	A23	Light Clothes	Motions in safe seating area	B	No	Ambient
98	OOP	C32	Light Clothes	Motions in NFZ	A	No	Ambient
99	FFC	C32	Light Clothes	Motions in safe seating area	D	No	Ambient
100	RFS	Arriva	Baby Doll, Hood	Motions in entire seating area	C	No	Ambient
101	ES	None	None	Motions of track and recline	(F)	N.A.	Car Heat
102	FFA	A32	Light Clothes, Magazine	Motions in safe seating area	E	Yes	Car Heat
103	OOP	A32	Light Clothes	Motions in NFZ	H	Yes	Car Heat
104	FFC	Century 1000	Infant Doll	Motions in safe seating area	G	No	Car Heat
105	RFS	Century 1000	Baby Doll	Motions in entire seating area	B	No	Car Heat
106	ES	None	Beaded Cover	Motions of track and recline	(A)	N.A.	Car Heat

FIG. 24E

107	FFA	A22	Rain Clothes	Motions in safe seating area	D	Yes	Car Heat
108	OOP	Vario Exclusive	Inflant Doll	Motions in NFZ	C	No	Car Heat
109	FFC	Touriva	Inflant Doll, Blanket	Motions in safe seating area	F	No	Car Heat
110	RFS	Century 590	Baby Doll	Motions in entire seating area	E	No	Car Heat
111	ES	None	Fabric Cover	Motions of track and recline	(H)	N.A.	Car Heat
112	FFA	A11	Light Clothes, Newspaper	Motions in safe seating area	G	No	Car Heat
113	OOP	A11	Light Clothes	Motions in NFZ	B	No	Car Heat
114	FFC	C32	Light Clothes	Motions in safe seating area	A	No	Car Heat
115	RFS	Touriva	Baby Doll, Blanket	Motions in entire seating area	D	No	Car Heat
116	ES	None	Blanket	Motions of track and recline	(C)	N.A.	Car Heat
117	FFA	A33	Heavy Clothes	Motions in safe seating area	F	No	Car Heat
118	OOP	C22	Heaby Clothes	Motions in NFZ	E	No	Car Heat
119	FFC	C22	Heavy Clothes	Motions in safe seating area	H	No	Car Heat
120	RFS	TLC	Baby Doll	Motions in entire seating area	G	No	Car Heat
121	ES	None	Attaché Case (flat)	Motions of track and recline	(G)	N.A.	Ambient
122	FFA	A21	Heavy Clothes, Magazine	Motions in safe seating area	H	Yes	Ambient
123	OOP	A21	Heavy Clothes	Motions in NFZ	E	Yes	Ambient
124	FFC	Century Ovation	Infant Doll	Motions in safe seating area	F	No	Ambient
125	RFS	Century Ovation	Baby Doll	Motions in entire seating area	C	No	Ambient
126	ES	None	Beaded Cover, Attaché Case	Motions of track and recline	(D)	N.A.	Ambient
127	FFA	A12	Rain Clothes	Motions in safe seating area	A	Yes	Ambient
128	OOP	Fisher Price CS	Inflant Doll, Blanket	Motions in NFZ	B	No	Ambient

FIG. 24F

129	FFC	Fisher Price CS	Inflant Doll	Motions in safe seating area	G	No	Ambient
130	RFS	Gerry Guard	Baby Doll, Handle up	Motions in entire seating area	H	No	Ambient
131	ES	None	Fabric Cover, Attaché Case	Motions of track and recline	(E)	N.A.	Ambient
132	FFA	A23	Heavy Clothes, Newspaper	Motions in safe seating area	F	No	Ambient
133	OOP	A23	Heavy Clothes	Motions in NFZ	C	No	Ambient
134	FFC	C11	Heavy Clothes	Motions in safe seating area	D	No	Ambient
135	RFS	Smartmove 5T	Baby Doll, Blanket	Motions in entire seating area	A	No	Ambient
136	ES	None	Blanket, Attaché Case	Motions of track and recline	(B)	N.A.	Ambient
137	FFA	A32	Rain Clothes	Motions in safe seating area	G	No	Ambient
138	OOP	C33	Rain Clothes	Motions in NFZ	H	No	Ambient
139	FFC	C33	Rain Clothes	Motions in safe seating area	E	No	Ambient
140	RFS	Discovery	Baby Doll, Handle up	Motions in entire seating area	F	No	Ambient
141	ES	None	Hand Bag	Motions of track and recline	(C)	N.A.	Solar Heat
142	FFA	A22	Medium Clothes, Magazine	Motions in safe seating area	D	Yes	Solar Heat
143	OOP	A22	Heavy Clothes	Motions in NFZ	A	Yes	Solar Heat
144	FFC	Gerry Booster	Child Doll	Motions in safe seating area	B	No	Solar Heat
145	RFS	Fisher Price CS	Baby Doll	Motions in entire seating area	G	No	Solar Heat
146	ES	None	Beaded Cover, Hand Bag	Motions of track and recline	(H)	N.A.	Solar Heat

FIG. 24G

147	FFA	A11	Medium Clothes	Motions in safe seating area	E	Yes	Solar Heat
148	OOP	Vario Exclusive	Inflant Doll	Motions in NFZ	F	No	Solar Heat
149	FFC	Ultara	Inflant Doll, Blanket	Motions in safe seating area	C	No	Solar Heat
150	RFS	Baby Safe	Baby Doll	Motions in entire seating area	D	No	Solar Heat
151	ES	None	Fabric Cover, Hand Bag	Motions of track and recline	(A)	N.A.	Solar Heat
152	FFA	A33	Medium Clothes, Newspaper	Motions in safe seating area	B	No	Solar Heat
153	OOP	A33	Medium Clothes	Motions in NFZ	G	No	Solar Heat
154	FFC	C33	Medium Clothes	Motions in safe seating area	H	No	Solar Heat
155	RFS	Vario Exclusive	Baby Doll, Blanket	Motions in entire seating area	E	No	Solar Heat
156	ES	None	Blanket, Hand Bag	Motions of track and recline	(F)	N.A.	Solar Heat
157	FFA	A21	Light Clothes	Motions in safe seating area	C	No	Solar Heat
158	OOP	C21	Light Clothes	Motions in NFZ	D	No	Solar Heat
159	FFC	C21	Light Clothes	Motions in safe seating area	A	No	Solar Heat
160	RFS	Rock'n'Ride	Baby Doll	Motions in entire seating area	B	No	Solar Heat

FIG. 24H

Network Independent Test Set Collection Matrix (Vehicle E)

Rev 1.1 (Under Construction)

#	Class	Subject/ Object	Attributes	Actions	Config.	Belt	Conditions
1	ES			Motions of track and recline	(A)	N.A.	Ambient
2	FFA			Motions in safe seating area	B	Yes	Ambient
3	OOP			Motions in NFZ	C	No	Ambient
4	FFC			Motions in safe seating area	D	No	Ambient
5	RFS			Motions in entire seating area	E	No	Ambient
6	ES			Motions of track and recline	(F)	N.A.	Ambient
7	FFA			Motions in safe seating area	G	Yes	Ambient
8	OOP			Motions in NFZ	H	No	Ambient
9	FFC			Motions in safe seating area	A	No	Ambient
10	RFS			Motions in entire seating area	B	No	Ambient
11	ES			Motions of track and recline	(C)	N.A.	Ambient
12	FFA			Motions in safe seating area	D	No	Ambient
13	OOP			Motions in NFZ	E	Yes	Ambient
14	FFC			Motions in safe seating area	F	No	Ambient
15	RFS			Motions in entire seating area	G	No	Ambient
16	ES			Motions of track and recline	(H)	N.A.	Ambient
17	FFA			Motions in safe seating area	A	No	Ambient
18	OOP			Motions in NFZ (standing)	B	No	Ambient
19	FFC			Motions in safe seating area	C	No	Ambient
20	RFS			Motions in entire seating area	D	No	Ambient

FIG. 25

CHARACTERISTICS OF THE DATA SETS

DATA SET	CONFIGURATIONS	SETUPS	VECTORS
TRAINING	130	1300	650,000
INDEPENDENT TEST	130	1300	195,000
VALIDATION	100	100	15,000

FIG. 26

DISTRIBUTION OF MAIN TRAINING SUBJECTS

OCCUPANCY	REPRESENTATION
EMPTY SEAT	10 %
HUMAN OCCUPANT	32 %
CHILD SEAT	58 %

FIG. 27

CHILD SEAT DISTRIBUTION

CHILD SEAT CONFIGURATION	REPRESENTATION
FORWARD FACING CHILD SEAT	40 %
FORWARD FACING CHILD SEAT OUT - OF-POSITION	4 %
REARWARD FACING CHILD SEAT	27 %
REARWARD FACING INFANT SEAT	29 %

FIG. 28

DISTRIBUTION OF ENVIRONMENTAL CONDITIONS

ENVIRONMENTAL CONDITION	REPRESENTATION
AMBIENT	56 %
STATIC HEAT (SOLAR LAMP)	25 %
DYNAMIC HEAT (CAR HEAT)	13 %
DYNAMIC COOLING (CAR A C)	6 %

FIG. 29

VALIDATION DATA DISTRIBUTION

OCCUPANCY	REPRESENTATION
EMPTY SEAT	8 %
HUMAN OCCUPANT	39 %
CHILD SEAT	53 %

FIG. 30

HUMAN SUBJECT DISTRIBUTION

HUMAN OCCUPANT	REPRESENTATION	NORMALLY SEATED	OUT-OF-POSITION
CHILD AGE 3	15 %	50 %	50 %
CHILD AGE 6	15 %	50 %	50 %
ADULT 5 TH PERCENTILE FEMALE	23 %	67 %	33 %
ADULT 50 TH PERCENTILE MALE	23 %	67 %	33 %
ADULT 95 TH PERCENTILE MALE	23 %	67 %	33 %

FIG. 31

CHILD SEAT DISTRIBUTION

CHILD SEAT CONFIGURATION	REPRESENTATION
FORWARD FACING CHILD SEAT	11 %
FORWARD FACING BOOSTER SEAT	11 %
REARWARD FACING CHILD SEAT	38 %
REARWARD FACING INFANT SEAT	40 %

FIG. 32

DISTRIBUTION OF ENVIRONMENTAL CONDITIONS

ENVIRONMENTAL CONDITION	REPRESENTATION
AMBIENT	63 %
STATIC HEAT (SOLAR LAMP)	13 %
DYNAMIC HEAT (CAR HEAT)	12 %
DYNAMIC COOLING (CAR AIR CONDITIONER)	12 %

FIG. 33

TRANSDUCER VOLUME

TRANS-DUCER	STARTING POINT			END POINT		
	SAMPLE	TIME (MS)	DISTANCE (MM)	SAMPLE	TIME (MS)	DISTANCE (MM)
A	5	0.83	142	29	4.84	822
B	3	0.50	85	35	5.84	992
C	7	1.17	198	34	5.67	964
H	2	0.33	57	32	5.34	907

FIG. 34

BASELINE NETWORK PERFORMANCE

SELF TEST SUCCESS RATE	95.3 %
INDEPENDENT TEST SUCCESS RATE	94.5 %
VALIDATION TEST SUCCESS RATE	92.7 %

FIG. 35

PERFORMANCE PER OCCUPANCY SUBSET

OCCUPANCY	INDEPENDENT TEST
EMPTY SEAT	96.1 %
NORMALLY SEATED ADULT	92.1 %
REARWARD FACING CHILD/INFANT SEAT	94.1 %
FORWARD FACING CHILD SEAT	96.9 %
OUT-OF-POSITION HUMAN/FFCS	93.0 %

FIG. 36

PERFORMANCE PER ENVIRONMENTAL CONDITIONS SUBSET

ENVIRONMENTAL CONDITION	INDEPENDENT TEST
AMBIENT	95.4 %
LONG TERM HEAT (LAMP HEAT)	95.2 %
SORT TERM HEATING/COOLING (HVAC)	93.5 %

FIG. 37

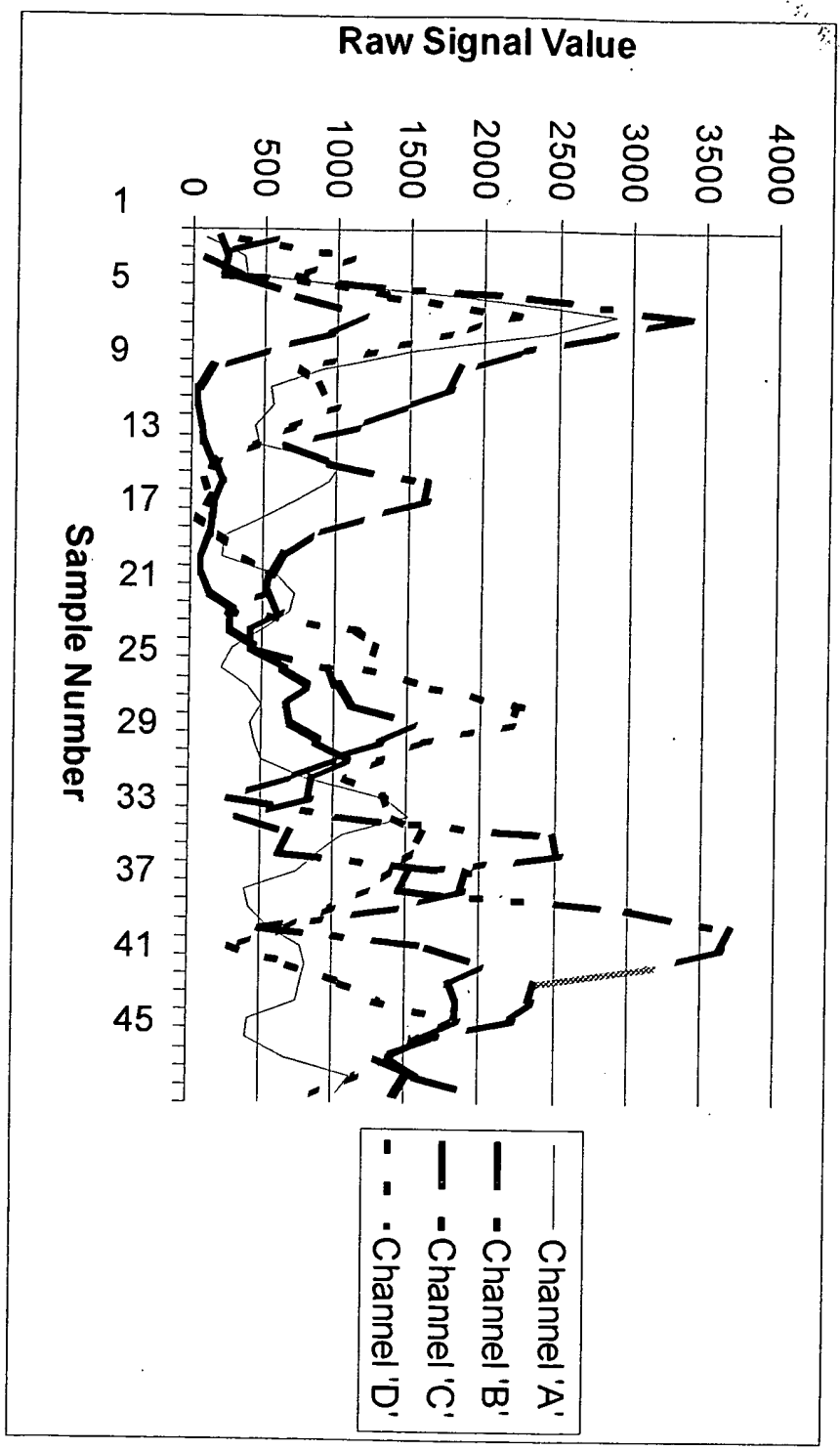
Raw Signal Value
0
500
1000
1500
2000
2500
3000
3500
4000
Sample Number
1
5
9
13
17
21
25
29
33
37
41
45
Channel 'A'
Channel 'B'
Channel 'C'
Channel 'D'

FIG. 38

NORMALIZATION STUDY RESULTS

NORMALIZATION METHOD	SELF TEST	INDEPENDENT TEST	VALIDATION TEST
A. WHOLE VECTOR (BASE)	95.3 %	94.5 %	92.7 %
B. PER CHANNEL	94.9 %	93.8 %	90.3 %
C. FIXED RANGE [0,4095]	95.6 %	90.3 %	88.3 %

FIG. 39

LOW THRESHOLD FILTER STUDY RESULTS

THRESHOLD LEVEL	SELF TEST	INDEPENDENT TEST	VALIDATION TEST
NONE (BASE)	95.3 %	94.5 %	92.7 %
5% OF 4095	95.3 %	94.4 %	91.9 %
10% OF 4095	95.3 %	94.3 %	92.5 %
20% OF 4095	95.1 %	94.2 %	86.4 %

FIG. 40